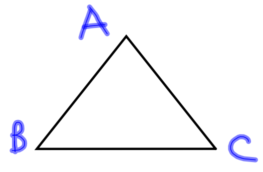
5.4 The Triangle Inequality

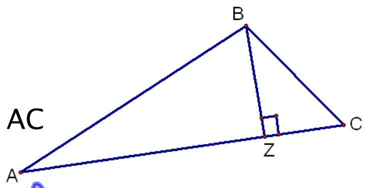
Thm. 5.11--<u>The triangle inequality theorem</u>--the sum of the lengths of any 2 sides of a triangle is greater than the length of the 3rd side.

$AB + BC > AC$
$AB + AC > BC$
$BC + AC > AB$



Let's Prove it.

Given: $\triangle ABC$
Prove: $AB + BC > AC$



S.	R.
① ———	① Given
② $AB > AZ$ $BC > ZC$	② Thm 5.10
③ $AB + BC > AZ + ZC$	③ Add.
④ $AZ + ZC = AC$	④ S.A.P.
⑤ $AB + BC > AC$	⑤ Subst.

Do the lengths represent a triangle?

4, 5, 7 $\quad 4+5 > 7$ yes

13, 12, 20 $\quad 13+12 > 20$ yes

7, 14, 21 $\quad 7+14 > 21$ No

7, 7, 7 $\quad$ yes

8, 8, 19 $\quad$ No

Two sides of a triangle are 6 and 11.
What is the range of the 3rd side?

$6+11=17$
$11-6=5$
$5 < x < 17$

Two sides of a triangle are 12 and 18.
What is the range of the 3rd side?

$12+18=30$
$18-12=6$
$6 < x < 30$

Distance Formula
A(0, 5)
B(8, 2)
C(4, 3.5)

Is this a $\triangle$?

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

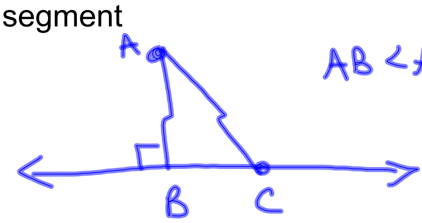
$AB=\sqrt{(8-0)^2+(2-5)^2} \approx 8.54$
$64+9$

$BC=\sqrt{(8-4)^2+(2-3.5)^2} \approx 4.27$
$16+2.25$

NO

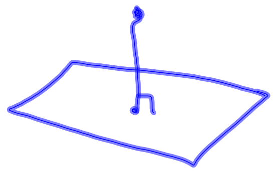
$AC=\sqrt{(4-0)^2+(3.5-5)^2} \approx 4.27$
$16+2.25$

Thm 5.12--Shortest distance from a point to a line is a perpendicular segment

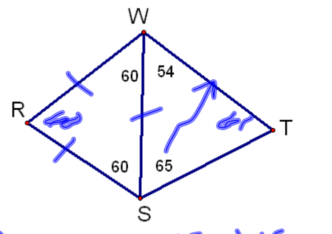


$AB < AC$

Corollary 5.1--shortest distance from a point to a plane is a perpendicular segment



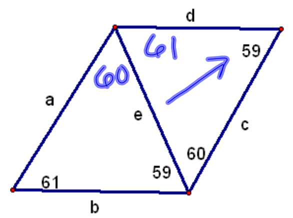
What is the longest segment?



$\triangle RWS$ $RW = RS = WS$

$\triangle WTS$ $WT > WS > ST$

What is the longest segment?



$e > b > a$

$c > d > e$

HW
p264-265
15-35odd, 38,41, 43